Tennessee Valley Authority, Post Office Box 2000, Decatur, Alabama 35609-2000

April 20, 2009

U.S. Nuclear Regulatory Commission
ATTN: Document Control Desk
Mail Stop: OWFN, P1-35
Washington, D. C. 20555-0001

10 CFR 50.73

Dear Sir:

TENNESSEE VALLEY AUTHORITY - BROWNS FERRY NUCLEAR PLANT (BFN) - UNIT 1 - DOCKET 50-259 - FACILITY OPERATING LICENSE DPR - 33 - LICENSEE EVENT REPORT (LER) 50-259/2009-001-00

The enclosed report provides details of a turbine trip and reactor scram from a power load unbalance signal on the main generator. TVA is reporting this in accordance with 10 CFR 50.73(a)(2)(iv)(A), as an event that resulted in a manual or automatic actuation of the systems listed in paragraph 10 CFR 50.73(a)(2)(iv)(B). There are no commitments in this letter.

Sincerely,

James J Randich FOR

R. G. West
Site Vice President, BFN
cc: See page 2

JE22
NRR

Enclosure
cc (Enclosure):

Ms. Eva A. Brown, Project Manager
U.S. Nuclear Regulatory Commission
(MS 08G9)
One White Flint, North
11555 Rockville Pike
Rockville, Maryland 20852-2739

Ms. Heather J. Gepford, Acting Branch Chief
U.S. Nuclear Regulatory Commission
Region II
Sam Nunn Atlanta Federal Center
61 Forsyth Street, SW, Suite 23T85
Atlanta, Georgia 30303-8931

NRC Resident Inspector
Browns Ferry Nuclear Plant
10833 Shaw Road
Athens, Alabama 35611-6970

NRC FORM 366 (9-2007) U.S. NUCLEAR REGULATORY COMMISSION

APPROVED BY OMB NO. 3150-0104 EXPIRES 08/31/2010

Estimated burden per response to comply with this mandatory collection request: 80 hours. Reported lessons learned are incorporated into the licensing process and fed back to industry. Send comments regarding burden estimate to the Records and FOIA/Privacy Service Branch (T-5 F52), U.S. Nuclear Regulatory Commission, Washington, DC 20555-0001, or by internet e-mail to infocollects@nrc.gov, and to the Desk Officer, Office of Information and Regulatory Affairs, NEOB-10202, (3150-0104), Office of Management and Budget, Washington, DC 20503. If a means used to impose an information collection does not display a currently valid OMB control number, the NRC may not conduct or sponsor, and a person is not required to respond to, the information collection.

LICENSEE EVENT REPORT (LER)

1. FACILITY NAME	2. DOCKET NUMBER	3. PAGE
Browns Ferry Unit 1	05000259	1 of 5

4. TITLE: Turbine Trip and Reactor Scram Due To Power Load Unbalance Signal On Main Generator

5. EVENT DATE			6. LER NUMBER			7. REPORT DATE			8. OTHER FACILITIES INVOLVED	
MONTH	DAY	YEAR	YEAR	SEQUENTIAL NUMBER	REV NO.	MONTH	DAY	YEAR	FACILITY NAME	DOCKET NUMBER
									None	N/A
02	18	2009	2009	- 001 -	00	04	20	2009	FACILITY NAME: None	DOCKET NUMBER: N/A

9. OPERATING MODE

1

10. POWER LEVEL

100

11. THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR §: *(Check all that apply)*

- ☐ 20.2201(b)
- ☐ 20.2201(d)
- ☐ 20.2203(a)(1)
- ☐ 20.2203(a)(2)(i)
- ☐ 20.2203(a)(2)(ii)
- ☐ 20.2203(a)(2)(iii)
- ☐ 20.2203(a)(2)(iv)
- ☐ 20.2203(a)(2)(v)
- ☐ 20.2203(a)(2)(vi)
- ☐ 20.2203(a)(3)(i)
- ☐ 20.2203(a)(3)(ii)
- ☐ 20.2203(a)(4)
- ☐ 50.36(c)(1)(i)(A)
- ☐ 50.36(c)(1)(ii)(A)
- ☐ 50.36(c)(2)
- ☐ 50.46(a)(3)(ii)
- ☐ 50.73(a)(2)(i)(A)
- ☐ 50.73(a)(2)(i)(B)
- ☐ 50.73(a)(2)(i)(C)
- ☐ 50.73(a)(2)(ii)(A)
- ☐ 50.73(a)(2)(ii)(B)
- ☐ 50.73(a)(2)(iii)
- ☒ 50.73(a)(2)(iv)(A)
- ☐ 50.73(a)(2)(v)(A)
- ☐ 50.73(a)(2)(v)(B)
- ☐ 50.73(a)(2)(v)(C)
- ☐ 50.73(a)(2)(v)(D)
- ☐ 50.73(a)(2)(vii)
- ☐ 50.73(a)(2)(viii)(A)
- ☐ 50.73(a)(2)(viii)(B)
- ☐ 50.73(a)(2)(ix)(A)
- ☐ 50.73(a)(2)(x)
- ☐ 73.71(a)(4)
- ☐ 73.71(a)(5)
- ☐ OTHER

Specify in Abstract below or in NRC Form 366A

12. LICENSEE CONTACT FOR THIS LER

NAME	TELEPHONE NUMBER *(Include Area Code)*
Steve Austin, Licensing Engineer	256-729-2070

13. COMPLETE ONE LINE FOR EACH COMPONENT FAILURE DESCRIBED IN THIS REPORT

CAUSE	SYSTEM	COMPONENT	MANU-FACTURER	REPORTABLE TO EPIX	CAUSE	SYSTEM	COMPONENT	MANU-FACTURER	REPORTABLE TO EPIX

14. SUPPLEMENTAL REPORT EXPECTED

☐ YES *(If yes, complete 15. EXPECTED SUBMISSION DATE)* ☒ NO

15. EXPECTED SUBMISSION DATE

MONTH	DAY	YEAR
N/A	N/A	N/A

ABSTRACT *(Limit to 1400 spaces, i.e., approximately 15 single-spaced typewritten lines)*

February 18, 2009, at 0351 hours Central Standard Time (CST), following a scheduled preventative maintenance activity, Unit 1 reactor automatically scrammed from a turbine trip due to a power load unbalance signal on the main generator. Specifically, at 0349 hours CST, Operations swapped the Unit 1 Main Generator Isophase Bus Duct System cooling fan from the running to the alternate fan. When the alternate fan started, water entrapped in the fan housing was expelled into the bus provided a path to ground inside the bus duct. This resulted in actuation of the generator protective relays and a turbine trip and automatic reactor scram, which resulted in the automatic actuation of the reactor protection system. Water that had settled in the idle bus duct cooling fan housing was expelled into the main generator isophase bus duct upon fan startup providing a conductive path to ground. The root cause of this event was less than adequate design process guidance for consideration of seasonal variations in the operating conditions for heating ventilation and air conditioning (HVAC) system design. The design process does not consider full range of operation of HVAC systems using raw cooling water as a cooling medium during the winter months. BFN inspected the Unit 1 isophase bus for damage. No damage was identified. BFN installed a drain with a site glass on each Unit 1 bus duct cooling fan housing. General Operating Instruction, Operations Round Logs, was revised requiring verification that there is no water in the idle fan and to drain any water that may have accumulated prior to placing it into service. BFN will modify the design change technical considerations checklist to provide design process guidance for consideration of seasonal variations in operating conditions for HVAC design.

NARRATIVE

I. PLANT CONDITION(S)

Prior to the event, Units 1 and 3 were in operating in Mode 1 at 100 percent thermal power (approximately 3458 megawatts thermal). Unit 2 was shutdown after manually scramming on February 16, 2009, due to a loss of the main generator stator cooling water [TJ]. LER 260/2009-001 discusses the manual scram event. Units 2 and 3 were unaffected by the event.

II. DESCRIPTION OF EVENT

A. Event:

February 18, 2009, at 0351 hours Central Standard Time (CST), following a scheduled preventative maintenance activity, Unit 1 reactor automatically scrammed from a turbine [TA] trip due to a power load unbalance signal on the main generator [TB]. Specifically, at 0349 hours CST, Operations swapped the Unit 1 Main Generator Isophase Bus Duct System cooling fan from the running to the alternate fan. When the alternate fan started, water entrapped in the fan housing was expelled into the bus provided a path to ground inside the bus duct. This resulted in actuation of the generator protective relays and a turbine trip and automatic reactor scram, which resulted in the automatic actuation of the reactor protection system [JC].

All automatic functions resulting from the turbine trip and automatic reactor scram occurred as expected. All control rods [AA] inserted. The level 3 scram setpoint was reached during the post scram water level shrink. Thus, the primary containment isolation system (PCIS) [JE] isolations: Group 2 (residual heat removal (RHR) system [BO] shutdown cooling), Group 3 (reactor water cleanup (RWCU)) [CE], System Group 6 (ventilation), and Group 8 (traversing incore probe (TIP)) [IG] were received along with the auto start of the control room emergency ventilation (CREV) [VI] system and the three standby gas treatment (SGT) [BH] system trains. The reactor scram resulted in the reactor water level briefly attaining minus 43-inches, and reactor pressure 1140 psig, hence; Operations briefly entered Emergency Operating Instruction, (EOI-001) Reactor Pressure Vessel Control.

Following verification that the 2-AOI-100-1, Reactor Scram, actions were completed the reactor mode switch was placed in shutdown. Operations reset the reactor scram by 0420 hours CST. Also, by approximately 0420 hours CST, operations reset the PCIS actuations and secured the SGT and CREV systems.

TVA is submitting this report in accordance with 10 CFR 50.73(a)(2)(iv)(A), as an event that resulted in a manual or automatic actuation of the systems listed in paragraph 10 CFR 50.73(a)(2)(iv)(B) (i.e., reactor protection system including reactor scram or trip, and general containment isolation signals affecting containment isolation valves in more than one system).

B. Inoperable Structures, Components, or Systems that Contributed to the Event:

None.

C. Dates and Approximate Times of Major Occurrences:

February 18, 2009 at 0351 hours CST	Unit 1 received automatic turbine trip and reactor scram.
February 18, 2009 at 0415 hours CST	Unit 1 operation reset Scram

February 18, 2009 at 0703 hours CST — TVA made a four hour non-emergency report per 10 CFR 50.72(b)(2)(iv)(B) and an eight hour non-emergency report per 10 CFR 50.72(b)(3)(iv)(A).

D. Other Systems or Secondary Functions Affected

None.

E. Method of Discovery

The turbine trip and reactor scram were immediately apparent to the control room staff through numerous alarms and indications.

F. Operator Actions

Operations personnel responded to the event according to applicable plant procedures.

G. Safety System Responses

The RPS logic responded to the reactor scram. All control rods inserted. The PCIS isolations Group 2 (RHR system shutdown cooling), Group 3 (RWCU system), Group 6 (ventilation), and Group 8 (TIP) isolation were received as expected, due to the lowering of the reactor water level, along with the auto start of the CREV system and the three SGT system trains. Emergency core cooling system actuation was not required.

III. CAUSE OF THE EVENT

A. Immediate Cause

Water that had settled in the idle bus duct cooling fan housing was expelled into the main generator isophase bus duct upon fan startup providing a conductive path to ground.

B. Root Cause

The root cause of this event was less than adequate design process guidance for consideration of seasonal variations in the operating conditions for heating ventilation and air conditioning (HVAC) design.

C. Contributing Factors

None.

IV. ANALYSIS OF THE EVENT

The original design of the BFN isophase bus cooling system included a single fan that pulled air across a cooling coil set and forced this air through the ductwork surrounding the electrical bus controlling the isophase bus temperature. The cooling medium for the isophase bus cooling system is raw service water, drawn from the Tennessee River. The temperature of the raw service water varies widely during the summer and winter months. Previous history review found sporadic instances of water in the isophase bus cooling system area during winter operation. However, the amount of water previously found did not previously pose any problems with plant operation.

Studies performed as part of the Extended Power Uprate (EPU) project found a design change was necessary to manage the heat load generated by the isophase bus at EPU conditions. Hence, BFN

issued design for a high capacity isophase bus cooling system. The design, based on the worst-case summer operating conditions, did not address wintertime operating conditions. BFN installed the high capacity Unit 1 isophase bus cooling system in 2006 as part of the Unit 1 recovery effort. The new installation contained two fan units.

On February 17, 2009, at approximately midnight, it began to rain at BFN. During the high humidity period, moisture carry over from the isophase bus cooling coil pooled within the idle fan housing. When operations started the idle fan, water that was in the idle fan housing was expelled into the bus duct grounded the isophase bus to the duct.

V. ASSESSMENT OF SAFETY CONSEQUENCES

The safety consequences of this event were not significant. BFN Unit 1 transient analysis includes a turbine trip and automatic reactor scram from 100 percent power. During and following the automatic scram, all safety systems operated as required. The operator actions taken in response to the scram were appropriate. These actions included the verification that the reactor had shutdown, the expected system isolations and indications had occurred, and subsequent restoration of these systems to normal pre-scram alignment.

PCIS groups 2, 3, 6, and 8 isolations were as expected. Although the Emergency Core Cooling Systems were available, none was required. No main steam relief valves [SB] actuated. The turbine bypass valves [JI] maintained reactor pressure. The main condenser remained available for heat rejection. Reactor water level was recovered and maintained by the reactor feed water [SJ] and condensate [SG] systems. Therefore, TVA concludes that the event did not affect the health and safety of the public.

VI. CORRECTIVE ACTIONS

A. Immediate Corrective Actions

BFN inspected the Unit 1 isophase bus for damage. No damage was identified.

BFN installed a drain with a site glass on each Unit 1 bus duct cooling fan housing. General Operating Instruction, Operations Round Logs, was revised requiring verification that there is no water in the idle fan and to drain any water that may have accumulated prior to placing it into service.

B. Corrective Actions to Prevent Recurrence [1]

BFN will modify the design change Technical Considerations Checklist to provide design process guidance for consideration of seasonal variations in operating conditions for HVAC design.

VII. ADDITIONAL INFORMATION

A. Failed Components

None.

[1] TVA does not consider the corrective action a regulatory requirement. TVA will track the completion of the actions in the Corrective Action Program.

LICENSEE EVENT REPORT (LER)

FACILITY NAME (1)	DOCKET (2)	LER NUMBER (6)			PAGE (3)
		YEAR	SEQUENTIAL NUMBER	REVISION NUMBER	
Browns Ferry Nuclear Plant Unit 1	05000259	2009	-- 001	-- 00	5 of 5

NARRATIVE

B. Previous LERs on Similar Events

None.

C. Additional Information

Corrective action document PER 163815.

D. Safety System Functional Failure Consideration:

This event is not a safety system functional failure in accordance with NEI 99-02.

E. Loss of Normal Heat Removal Consideration:

This event was not a complicated scram according to NEI 99-02.

VIII. COMMITMENTS

None.